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Millimeter and submillimeter observations of comet 67P/C-G with the MIRO instrument

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Abstract

The Microwave Instrument on the Rosetta Orbiter (MIRO) [3] makes submillimeter- and millimeter-wavelength observations of the nucleus and coma of the target comet of the Rosetta mission (Comet 67P/Churyumov-Gerasimenko). By making broadband continuum measurements at two wavelengths (approximately 0.5 and 1.6 mm), MIRO probes the thermal and dielectric properties of the nucleus subsurface. High-resolution spectroscopic measurements of 8 molecular lines in the submillimeter (H_2O, $H_2{}^{17}O$, $H_2{}^{18}O$, CO, NH_3, and three lines of CH_3OH) constrain the abundance, velocity, and temperature of gases in the coma. These measurements allow MIRO to study the nucleus and coma as a coupled system.

Upon arrival at the comet (August 2014) measurements by MIRO [4] and other instruments quickly determined that the upper ~10 cm of the nucleus generally have thermal properties consistent with very porous, dusty material, but that there is ice within the upper few cm at least in some regions. It was also found that gas emission from the nucleus varies with location and time.

More recently, we have begun to study in detail the time and spatial variability of the nucleus [2, 6] and coma [1, 5]. This presentation will provide an overview of the MIRO instrument, our data sets, and provide a high-level discussion of what we are learning about the upper meter of the nucleus' surface and the distribution and transport of water.

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